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Case Report

New technique to overcome surgical pitfall during Chiari osteotomy

Khalid A. Bakarman, ABOS

Department of Orthopedics, College of Medicine and King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia

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الملخص

البضع العظمي للحوض بطريقة كياري هو عملية إنقاذية, هدفها الرئيسي تأمين غطاء جانبي لرأس الفخذ عند البالغين المصابين بثدن الحق. ومستوى البضع العظمي مهم جدا ومصيري. حيث يجب أن تقل المسافة بين البضع العظمي وتجويف المفصل عن خمسة ملم وبزاوية مع الاتجاه الرأسي بمقدار عشر درجات باتجاه المفصل العجزي الحرقفي. إن البضع العظمي عالي المستوى سيحدث فجوة غير مرغوب بها بين رأس الفخذ والحق الجديد. نصف هنا طريقة جديدة تهدف إلى التغلب على هذه الفجوة غير المرغوب بها التي حدثت بالبضع العظمي عالي المستوى لفتاة بعمر أربعة عشر عاما لديها بقايا ثدن في الحق بعد أن عولجت جراحيا لإصابتها بخلع تطوري للورك. هذه الطريقة تتضمن نقل الجانب الوحشي للعظم الحرقفي دون الحاجة إلى إزالة البضع العظمي بطريقة كياري وأسفرت الطريقة عن نتائج جيدة في هذه الحالة.

الكلمات المفتاحية: كياري; البضع العظمي; الحق; ثدن

Abstract

Chiari pelvic osteotomy is a salvage procedure, which aims mainly to achieve lateral coverage of femoral head in adolescents with acetabular dysplasia. The level of pelvic osteotomy is very important and crucial. It should be less than five mm from the joint space and directed with a cephalic inclination of 10° toward the sacroiliac joint. High-level osteotomy will create an undesired step between the femoral head and the new acetabulum. A new technique is described here to overcome an undesired step that was created by high level osteotomy in a 14 year old girl with residual acetabular dysplasia after surgically treated developmental dysplasia of the hip. The technique included distal transfer of the lateral part of the iliac bone without the need to dismantle the Chiari osteotomy and resulted in good outcome.

Keywords: Acetabular; Chiari; Dysplasia; Osteotomy

Corresponding author: Assistant Professor and Consultant Orthopedic Surgeon, Department of Orthopedics, College of Medicine and King Khalid University Hospital, King Saud University, PO Box 7805, Riyadh 11472, Kingdom of Saudi Arabia. Tel.: +966 1 467 0871; fax: +966 1 467 9436.

E-mail: kbakarman@yahoo.com

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Introduction

Chiari pelvic osteotomy was first introduced by Karl Chiari in 1950 as a salvage procedure for residual acetabular dysplasia in adolescents.[1,2] An osteotomy performed too high may create a step between the true acetabulum and the added lateral coverage leaving no improvement in weight bearing distribution and failure of the procedure.[3–6]

The present report described a pitfall of high-level cut that was managed by a new technique where a part of the iliac bone above the new lateral coverage was distally transferred to the level of the roof of the true acetabulum.

Case report

A 14 year old female patient was seen and followed up at the King Khalid University Hospital due to right side developmental dysplasia of the hip (DDH), which was diagnosed at the age of two and half years after a period of limping. At the age of 2 years and 8 months the patient received initial treatment of skin traction for 2 weeks with gradual abduction after adductor tenotomy was followed by open reduction and derotation femoral shortening osteotomy. Hip spica was applied for 8 weeks, then changed to a broom stick cast, which lasted for another 6 weeks.

At the age of four the femoral plate was removed. The patient was asymptomatic and walking well, but during the follow up the X-rays showed acetabular dysplasia with a tendency of subluxation of the right hip. The condition deteriorated to an extent that at the age of eight, she underwent another open reduction with Pemberton acetabuloplasty followed by 2 months of hip spica immobilization.

The patient did well after the second surgery along with the regular follow up at the outpatient clinic. At the age of 13 she started complaining of mild pain and limping after walking for long periods. Clinical examination revealed limitation of hip flexion by 20° without femoral acetabular impingement and a slightly positive Trendelenburg sign. In other words, the patient was classified as grade fair according to Berkeley hip score.[7] The follow up plain X-rays showed residual acetabular dysplasia and partial uncoverage of the femoral head (Figure 1). The decision was taken after the patient's parents' consent to perform Chiari pelvic osteotomy.

The surgery was performed at the age of 14 and the osteotomy was fixed with two cannulated screws. Postoperative X-ray showed a step of 14 mm due to the beginning of the osteotomy proximal to the lateral edge of the true acetabulum (Figure 2), a situation which was not accepted. The parents were informed about the complication and the importance of its surgical correction. The decision was taken to revise the surgery next day. The plan was to take out the lower screw fixing the Chiari osteotomy then to make a longitudinal cut of both inner and outer tables of the lateral part of the iliac bone starting from the base of the step and going upward to the entire length of the iliac bone resulting in a free piece of iliac bone laterally with a height of about 3 cm. The free piece of iliac bone was then mobilized distally to eliminate the step (Figure 3). The transferred iliac piece of bone was fixed with a

Figure 2: Anteroposterior radiograph immediately after Chiari osteotomy showing a high level osteotomy (14 mm).

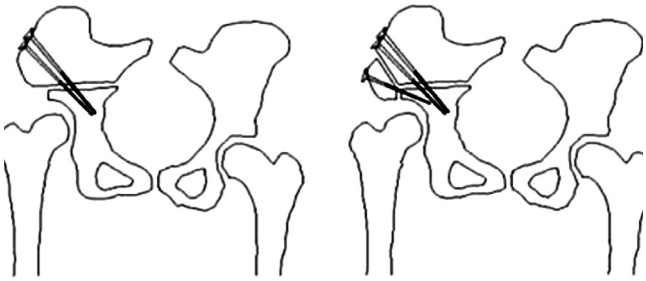

Figure 3: A diagram showing the distal transfer of the proximal outer iliac bone table to solve the problem of the step that was created by a high level cut during Chiari osteotomy.

Figure 1: Anteroposterior radiograph of the patient at the age of 13, showing residual acetabular dysplasia with a center-edge angle of 9° and 59% femoral head coverage.

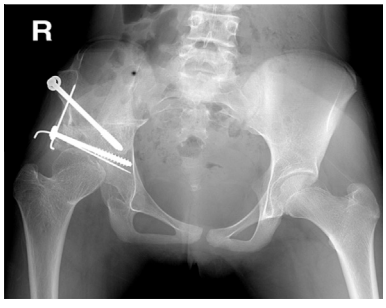

Figure 4: Postoperative standing Anteroposterior radiograph showing center-edge angle of 40° and 100% femoral head coverage.

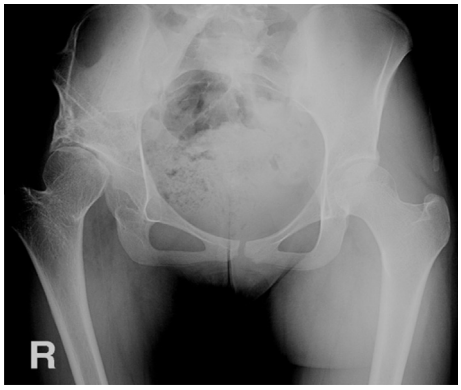

Figure 5: Anteroposterior radiograph at the final follow up showing full head coverage and center-edge angle of 40°.

partially threaded cannulated screw and a 1.6 mm K-wire. Final position was checked through the image intensifier and found to be satisfactory. Skin traction was used for 1 week. The patient began a non-weight bearing mobilization with axillary crutches for 6 weeks and then gradually to a full weight bearing. The follow up X-rays after the full weigh bearing were satisfactory (Figure 4). Two years later the screws and k-wires were removed. At the last clinic visit, the patient was generally happy with the results; she had no pain and almost full range of hip motions, but mild limping. The overall clinical assessment of the hip function was improved according to Berkeley hip score[7] to grade good. The last X-ray at the age of 19 (Figure 5) showed good coverage of the femoral head and within normal center-edge angle.

Discussion

Chiari pelvic osteotomy aims to enlarge the acetabulum by medial displacement of the distal pelvic fragment. It is designed to make the cut surface of the proximal fragment continue with the acetabular roof providing additional coverage for the femoral head and the capsule is interposed between the osteotomy and the femoral head.[8]

Biomechanical studies[1,2,9,10] have shown that medialization of the acetabulum leads to the improvement of the lever arm on the hip with a reduction of the body weight moment arm and a decrease in pressure on the femoral head. According to Chiari, there is reduction in the pressure on the femoral head as much as 20% with 15 mm medialization.[9]

Chiari osteotomy is usually considered a salvage procedure in cases of hip incongruity, by providing a fibrocartilagenous cover over the femoral head as a result of the metaplasia of the interposed capsule[9,12] or at least well-vascularized connective tissue.[10,11] The procedure is often restricted to the mostly deformed hips with joint incongruity in late adolescence.[3] Hip incongruity is usually related to acetabular dysplasia, either congenital or neurologic, or to femoral incongruity resulting from coxa magna as in cases of Perthes' disease.[3]

The osteotomy level and direction have been described as the most important factors influencing the outcome of Chiari osteotomy.[5,9,11–13] The osteotomy is directed medially and 10–15° upward. A greater angulation may enter and damage the sacroiliac joint while smaller angulations place the resultant shelf too high and reduces lateral coverage of the femoral head. Graham et al. and Karami et al.[5,6] reported that the rate of remodeling is up to 85% in the step less than five mm, while there is partial remodeling if the step measures 7 mm. Ohashi et al. and Karami et al.[6,13] stated that a step of 7 mm could be overcome by anterior bone graft augmentation, but they noticed resorption of about 25% of bone graft.

This report presents and describes a simple, easy and efficient way to get rid of the step created by Chiari osteotomy when performed at a higher level with no risk of bone graft resorption as in the case of doing shelf with augmented bone graft, with no need to dismantle the Chiari osteotomy site.

Conclusion

All attempts must be made to perform Chiari osteotomy properly particularly regarding the level and direction of the osteotomy. If the osteotomy level exceeds five mm it is not acceptable and must be corrected as soon as possible. The reported technique in this report is a simple, safe, and efficient way to overcome the undesirable step that could be created by a high level cut during Chiari osteotomy.

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